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Addressing the climate policy gap in Wales
Research Briefing

June 2019

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The briefing has been written by Dr Filippos Proedrou from the University of South Wales under Senedd Research's Academic Fellowship Scheme to support Assembly Members in their climate change scrutiny.

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1. Abstract

This report addresses the climate policy gap in Wales. It draws from the author's expertise and decade-long interdisciplinary research on energy and climate policy, energy transitions and ecological economics, as well as from his participation in the multi-million, EU-funded **WiseGRID** project on smart grids. The report is also based on a thorough scrutiny of the Welsh political and climate policy context and existing legislative framework, the work of the National Assembly for Wales Climate Change, Environment and Rural Affairs Committee, the Welsh Government's related policy documents, including the most recent ***Prosperity for All: A low carbon Wales***, and the UK Committee on Climate Change advice and reports, including the very recent report ***Net Zero: The UK's contribution to stopping global warming***. The report contributes insights and conceptualisations of the climate change challenge and its interaction with other key political and policy priorities, and sources evidence and best practices from around the world.

After mapping the current policy framework, the report argues for bolder climate targets in line with climate science and proportionate carbon budgets to the effect of carbon neutrality before 2050. This advice is premised upon the strong legal grounds of the *Well-being of Future Generations (Wales) Act 2015*, compelling economic arguments regarding the costs of climate inaction and the merits of front-loaded action, and developing political grounds emanating from civil society pressure and the need for a more pivotal role for the state.

The report elaborates on the co-benefits of an ambitious climate policy, and provides ample evidence and global best practices that can be utilised in Wales. It also discusses Welsh climate policy within the broader growth paradigm Wales follows, and sets out different energy transition pathways.

The report also recalibrates current policy schemes and proposals on the table. More specifically, it qualifies the need for an energy company for Wales, and delineates the role and the tasks it could play, and looks into the potential for rendering the Zone Demarcation Scheme more engaging with local communities/ citizens. Caught within the current Brexit conundrum, the report also points at a number of implications Brexit can bear for Welsh climate policy.

2. Executive Summary

Recalibrating climate targets and budgets

- The cascading effects of climate change and most recent scientific recommendations call for **substantially upscaled climate action,** targeting the **1.5** degrees Celsius targets**, carbon neutrality before 2050** and correspondingly **tighter carbon budgets** towards mid-century.
- **There are strong economic, legal and political grounds for a bolder climate policy.**
- **Front-loaded climate action is most cost-efficient and increases possibilities for the successful mitigation of climate change.**
- An ambitious climate agenda strongly resonates with and is grounded upon the ***Well-being of Future Generations (Wales) Act 2015***.
- **Civil society** pressure and the declaration of a **climate emergency** render a more **risk-taking interventionist state** an absolute necessity.

Designing energy policy for a fast-track energy transition

- The basis of a bold climate policy is a **radical energy policy** to implement **a fast-track energy transition.** This necessarily involves **a dual and synchronous move away from fossil fuels** (including the rapid phasing out of coal, the abandonment of shale ambitions, the reduction and circumscription of oil use to transport and the utilisation of gas as a true fuel-in-transition up to the 2040 horizon) **and towards clean and smart energy sources and systems** (including proliferating bottom-up and decentralised forms of energy generation, community energy, as well as big scale renewable parks and moves towards a Welsh supergrid to match energy needs and interests)**.**
- The energy transition may foster growth in some areas, but also tamper with growth in others. **Sustainable welfare is a better match for strategies carrying out ambitious climate agendas**; hence policy-makers could consider untangling from the growth imperative.
- The energy transition can take a predominantly top-down and centralised, or bottom-up and decentralised form. While both dimensions are indispensable, the Well-being of Future Generations Act mandates strong citizen engagement in the co-production of energy and participation in energy decision-making, and hence conveys a strong bottom-up flavour to the energy transition. At the same time, climate performance will be more effective if it embraces the majority of the population in this grand endeavour.

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- The energy transition must increase, rather than undermine, equality. This calls for a differentiated set of measures that include: the prioritisation of **ending energy poverty** through **binary climate-social policy schemes**; proportional support to the most affluent to immerse into clean energy schemes; and, nudging the business sector to contribute its fair share in the climate struggle by increasing corporate sourcing of clean energy.

Recalibrating current schemes/ proposals on the table

- **Climate policy can be bundled with other public policy issues** to yield positive outcomes on multiple fronts**.** Substantial **co-benefits** can be reaped by an ambitious climate agenda in particular in regards to **economic development, health, social policy and energy security.**
- **An energy company for Wales is essential in this juncture. While rightly rejected as a green energy producer and provider,** there is ample space for the establishment of a public energy company **as the central facilitator of decarbonisation that will design, gear and upscale the energy transition in line with climate imperatives.** Its main functions should be to steer, design and implement the strategic trajectory of the Welsh energy transition; to enhance the swift generation of renewable energy serving as the entry point and one-stop-shop for all stakeholders; to effect demand management; and to take up an active regulatory role in an emergent Welsh supergrid. To these purposes, it will need three distinct arms: a Funding Facility to foster renewable energy generation and energy efficiency measures; a Distribution System Operator for the Welsh supergrid; and a Research and Technology Centre.
- A more **engaging approach** is necessary in regards **to the Zone Demarcation Scheme. People involvement, lay knowledge and consent** is indispensable and calls for the **granting of significant returns to the local community** so that it can also accept the associated downfalls. This also allows ample room for **local community utilities to step up and proliferate.**

3. Introduction - Climate science and the emissions gap

Climate change has been recognised as a global problem since the 1980s. The **Intergovernmental Panel for Climate Change (IPCC)** issued its first report in the late 1980s warning that there is likelihood of anthropogenic climate change that will carry significant ramifications for humanity. Subsequently, and on the basis of mounting evidence, the IPCC expressed its certainty that anthropogenic climate change was indeed a fact. The initial threshold for climate change mitigation was put to levelling off the concentration of greenhouse gases (GhG) in the atmosphere to no more than 450 parts per million (ppm), which would stem the average global temperature to maximum 2 degrees Celsius.

In this context, the States signing the **Paris Agreement** in 2015 committed to work towards the achievement of this goal through the submission of their nationally determined contributions. Nevertheless, the sum of the pledges the states have submitted in the aftermath of the Paris climate summit bring the average global temperature increase to 3+ degrees Celsius, an unbearable level of climate change. Within this framework, the states of the Global North acquiesced to lower their emissions by at least 80% by 2050, a target far too slack in light of pressing climate imperatives.

Synchronously with these international political developments, the cascading rise of greenhouse gas emissions has accelerated the impact on the climate. Hence, the IPCC in its most recent report in the autumn of 2018 recommends that global efforts are stepped up to target a global average temperature increase of no more than 1.5 degrees Celsius. Despite such recommendations, States' climate policies have not been updated to meet the 1.5 target, which practically mandates a goal of **carbon neutrality (defined as the balance between anthropogenic emissions by sources and removals by sinks**) before 2050. For the Global North, other **reports** call for carbon neutrality to be achieved even earlier, and in any case no later than 2040.

Within this global political framework and shrinking biophysical environment, states of the Global North are struggling with the challenge to address the sizable emissions gap. This calls for substantially upscaling their climate efforts, emboldening their climate ambitions, tightening their carbon budgets, and focusing on a swift energy transition of unprecedented scale away from fossil fuels and towards clean energy sources and systems to meet human needs.

4. Wales: background and state of the art

Within this rapidly changing international context the UK Government has taken a number of initiatives that also bind Wales. The **2008 UK Climate Change Act** set the goal of 80% emissions reduction by 2050 compared to 1990 levels and institutionalised fixed-term carbon budgets. The UK is also part of, and played a great role in engineering, the EU Climate and Energy Packages for **2020** and **2030** that mandate a 20% emissions reduction, 20% share of renewables in the energy mix and 20% energy efficiency (20-20-20 goals) by 2020, and the updated 40-32-32.5 goals for 2030 (The 2030 goals may be reconsidered once and if the UK leaves the EU). The UK also participates in the **EU Emissions Trading System (ETS)** as a means to lower emissions and incentivise energy efficiency and renewable energy generation (again, the future position of the UK in this mechanism remains uncertain due to Brexit). The UK, moreover, has signed the 2015 Paris Agreement and has submitted its contribution plan to lower its emissions by 80% compared to 1990 levels by 2050.

The **Welsh Government's 2010 Climate Change Strategy** (PDF 2.70MB) was the first official document to place the climate challenge into the Welsh policy map, setting the overall climate direction and non-statutory climate targets for Wales. It mandated a 40% emissions reduction by 2020 against 1990 levels, as well as a 3% annual decrease in emissions in areas within devolved competence against the benchmark of the average emissions of the period 2006-2010. Building on this, the ***Environment (Wales) Act 2016*** paved the way for the setting of statutory emissions reductions targets and the design of carbon budgets. A year earlier, the innovative **Well-being of Future Generations (Wales) Act (WFGA)** institutionalised the obligation to embed sustainability concerns and ambitions in governmental policy. The goal for creating a low carbon society has been set in law with the first WFGA goal of **a prosperous Wales**.

On the basis of the Environment Wales Act 2016, the Welsh Government put in place a roadmap to 2050 with the ***Climate Change (Wales) Regulations 2018*.** In particular, it committed to cut emissions by 27% by 2020, by 45% by 2030, by 67% by 2040, and by at least 80% by 2050 compared to 1990 levels. To this aim, the Welsh Government has designed its first carbon budgets mandating a 23% emissions reduction in the period 2016-2020, and a 33% reduction in the period 2021-2125. The Welsh Government is expected to design the next carbon budget for the period 2026-2030 by the end of 2020. Wales' more concrete climate goals include **halving food waste by 2025** and generating **70% of its electricity from renewables by 2030**, which it is on course to meet. The Welsh Government published in May 2019 its more detailed document regarding the implementation of its climate policy, **Prosperity for**

all: A low carbon Wales, with 100 policies and proposals for bringing emissions down and implementing current and future carbon budgets.

Against this policy entrepreneurship, **UK emissions have come down by 41% since 1990**. **Welsh emissions, however, were only 14% lower in 2016 than in 1990**. While they decreased in 2014 and 2015, they **increased again in 2016 by 5%**. In 2016, more specifically, emissions went up in the power, agricultural, buildings, and transport sectors, only slightly offset by reductions in industry. Since 2009, Welsh emissions have in fact gone up by 5%, in the main due to increases in emissions from the power sector (5% each year on average).

In light of difficulties in bringing emissions down drastically, intensified climatic phenomena and the most recent assertions and warnings of the IPCC, **the UK Committee on Climate Change has very recently (May 2019) recommended** a significant upscaling of climate action and ambition to 100% carbon neutrality by 2050 for the UK. The bar has been set to 95% for Wales, due to **Wales' lack of land to accommodate storage facilities for the treatment of fossil fuels and its sizable agricultural activity.** These recommendations are strong in both their coverage and implementation, as they include international aviation and shipping but exclude international offsets (as has been the case for Wales with the Climate Change Wales Regulations 2018), and have been endorsed by the UK Government. The Welsh Government not only **endorsed** the updated goal, but **committed to achieving the overall 100% UK goal**, promising to put in law the amended target for 2050, bring forward concomitant regulation, and tailor the third budget and adjust the interim targets accordingly.

Increasing evidence about both the impact and pace of climate change and the potential for mitigation have encouraged these policy shifts. While they remain substantially responsive in nature, rather than proactive, they bring home the understanding that the managerial and business as usual approach of the previous decades is far from fit for purpose and hence needs to be replaced by a visionary leadership style of policy-making to fast-track the energy transition.

In this rapidly evolving policy context, this report aims to facilitate the implementation of fast-track decarbonisation in four distinct ways. First, it provides solid grounds for a Welsh climate policy that will be more ambitious than the official line, advising for carbon neutrality before 2050 to contribute to the 1.5. goal. Second, it situates climate policy more firmly within the public policy agenda. Third, it showcases global best practices that can facilitate the implementation of tight carbon budgets. Fourth, it sets out concrete energy policy pathways and sectoral decarbonisation roadmaps.

PART I: NUANCING AND RE-SCALING THE CLIMATE CHALLENGE

5. The case for tight carbon budgets in line with the 1.5 target

5.1. Economic grounds

Climate goals and carbon budgets have to be:

- responsive to climate science recommendations; and
- proportional to climate needs, rather than to economic means.

Very ambitious climate targets and much tighter carbon budgets hence are essential and call for front-loaded climate action. This is not only a moral issue, one of principle. It is also **more prudent in economic terms**, as it will avert an additional layer of costs associated with further climate change (see Box 1). To put it reversely, a bold climate policy can deliver far-fetched economic benefits in the form of **avoided climate damage and lesser costs for adaptation**.

In this context, economic goals, growth, employment etc. must not come ahead of and compromise decarbonisation and sustainability. As the **Stern Review** of 2006 first disclosed, **climate action to ensure sustainability is cheaper the earlier it takes place**. To the contrary, the bill only goes up with the years. Climate inaction hence comes with a hefty price tag. Buck-passing the costs to the future generations obviously does not make the problem disappear. Indeed, this is part of the predicament we are currently facing. Had humanity taken profound climate action two decades earlier, climate change mitigation would have cost less and could have been carried out in longer temporal frameworks, and hence in a smoother way. Climate change mitigation is very expensive today, exactly due to the oblivion to act when we should have.

Box 1. Climate change costs

- Climate change-induced extreme events, heatwaves and natural catastrophes hitting urban and rural spaces and demanding big chunks of the budget for restoration (**Hurricane Sandy, for example, caused New York City $19 billion in damages; California's wildfires cost only in November 2018 at least $9 billion**).
- Less water availability and disrupted food systems can lead to diminishing crop yields, less productive land use, food shortages and/ or higher food prices (**Italy's olives harvest, for example, has more than halved for climate-change related reasons**).
- Investment losses **on soon-to-be-stranded fossil fuels assets** and hence costs ensuing from the burst of the **carbon bubble**.
- More abrupt, and hence more expensive, policy changes needed in the near future.
- Loss of biodiversity, ecosystems resilience and aesthetic beauty, potentially impacting the Welsh tourist industry.
- Costs emanating from heightened **systemic risks** – climate disruption leads to human life disruption leading to migratory pressures and conflict.
- Costs associated with yet unknown further Earth system feedbacks, defined as further changes stimulated by ecosystems in response to initial changes geared by external forces, leading from small to runaway changes.

In energy terms, the transition implies a gradual appropriation of fossil energy for the establishment of renewable energy installations and clean energy grids, which will go hand in hand with standard fossil fuel use. In case this phase is not swift, but protracted, mathematical models show that **it will be virtually impossible for fossil-dependent countries, like the UK and Wales, to achieve both climate mitigation and energy security**; either climate goals will overshoot, or energy shortages will emerge as a result of lower renewable capacity and climate-induced relinquished fossil use. In this understanding, the pace of transition and the time-frame targeted become the most essential variables. A sub-optimally rapid transition would lock countries in an inescapable **energy-emissions trap.** To the contrary, a rapid rollout of renewable energy and energy efficiency schemes makes much economic sense, as **upfront costs are recovered through fuel savings**.

The argument that front-loaded action was and still is not needed, as with time new technologies will be developed on time to reverse climate change, besides being plainly speculative and deterministic, is counter-productive as it encourages inertia. Moreover, it runs contrary to the empirics of the energy industry. Oil is by far the most productive energy fuel, but humans have failed to find any equivalent to substitute it since the 1970s, thus clinging to its perpetual use (shale oil is much less efficient, as its production is extremely energy and water intense). While waiting for technological breakthroughs to save the day, however, more emissions are concentrated in the atmosphere; as a result, climate change mitigation costs rise exponentially.

One should hence not examine the costs climate policy will inflict on the economy, and endeavour to strike a balance between ambition, achievability and cost. Rather, one should zoom in on the further costs climate change will effect on the economy. In other words, a dynamic rather than static cost-benefit analysis is needed.

Against this background, the dominant policy dilemma between cost-efficiency and climate change action collapses. **Skipping climate action-related costs will only make us poorer, not richer, as climate change continues generating rising costs.** In this context, it is preferable to endure climate policy costs that will ensure sustainability, rather than suffer increasing costs by an overburdened climate without securing sustainability. To achieve the former, it is essential to set ambitious goals and implement tight carbon budgets in line with biophysical limits, rather than economic considerations. A steep downward trajectory for emissions is required, calling for **front-loaded emissions reductions**.

5.2. Legal grounds

Very ambitious climate targets and much tighter carbon budgets are also **consonant with the key WFGA** that places sustainability and the plight of the youngest at the centre, and mandates that all policies serve both traditional sectoral goals and interests as well as the principle of sustainability.

In fact, when designing climate policy one should approach the issue through the eyes of today's children and teenagers, who are both currently unrepresented and will bear the brunt of climate inaction. **The UK-wide pupils' strike in February 2019**, followed by the **May 2019 Youth Strike 4 Climate**, pays tribute to their plight and should act as a belated awakening springboard. A new mental condition, **eco-anxiety**, is emerging, which refers to the anxiety and associated symptoms induced by fear of imminent environmental catastrophes that can ruin lives and push people to leave their lands and migrate, among others. It is through the empathy with the

youngest generation and a rounded understanding of increasing eco-anxiety that policy-makers must approach climate policy.

Fortunately enough, ambitious climate policy can deliver on across the board goals. In fact, the bundling concept, according to which climate policy must be seen as embedded in and congruent with all other policies and goals, is enshrined in the WFGA. In this context, climate policy can cater for and benefit not only the climate, but also other public policy issues, such as health, air quality, the economy, energy policy and security, social policy etc. This bundling approach consists in an integrated audit of:

a) the **co-benefits**, both directly and indirectly monetisable, that accrue to other public policy issues from climate policy measures; and

b) the **savings** that accrue from a reduction in the necessary investments to address other public policy issues.

Bundling climate policy-related investments with other public policy issues is a more economic and cost-efficient way to tackle climate change, compared to business as usual siloed sectoral funds targeting sector-specific-only problems. The design of tight carbon budgets hence can be seen to follow the spirit and letter of the WFGA, as it can lead to:

- *integration* of different policies and their costs and benefits;
- *collaboration* among stakeholders transcending sectoral boundaries
- *involvement* of citizens and local communities to *prevent* worse-case scenarios and ensure positive results in the *long-term*;
- Welsh *prosperity* and *resilience*;
- improved *health* of its citizens;
- the conditions for more *equality*, *cohesive communities* and *vibrant culture*; and
- a *globally responsible* country freeing up more vital carbon space for the Global South.

In the ninth section, the report elaborates on the bundling logic and associated benefits, and demonstrates how a far-fetched climate policy can be in the service of the WFGA goals.

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5.3. Political grounds

Civil society in the UK has a pronounced presence and role in endeavouring to gear the UK government towards much more effective climate policy (see Box 2). Policy-makers hence are not in a situation where they have to take bold climate initiatives against the will of their constituencies; to the contrary, policy-makers only have to respond to growing popular frustration with contemporary, business as usual climate policy, implement long awaited radical climate measures and turn the tides around in the climate struggle. Indeed, civil society pressure has pushed the UK government and the devolved Welsh and Scottish governments to declare a **climate emergency in April 2019**, after which one would expect ground-breaking policies to be set to reverse climate change. While this has paradoxically not been the case, designing climate policy responding to an emergency rather than in a business as usual policy mode is critical at this juncture. In this context, the issue is not one of subsuming climate policy under broader economic, health, social policy priorities etc., but how radical, effective climate policy can also serve standard economic and social goals.

Box 2. The role and push of UK civil society

The rise of the global climate movement Extinction Rebellion, very active across the UK as a whole, exemplifies the struggle for a systemic change to avert climate change. The youth's developing agitation over climate change also helps retain the issue on the agenda and acts as a persistent lever for pressure. Crucially, these movements round the global civil society's agitation around climate change mitigation. Besides the long-standing activity of environmental organisations such as Greenpeace, the World Wide Fund for Nature (WWF) and Friends of the Earth among others, pro-climate civil society movements have played a critical part in British politics opening up windows of opportunities and acting as policy entrepreneurs. The current juncture is akin, but even more critical due to even more pressing timetables, to the **2005 'Big Ask' campaign** the Friends of the Earth launched. Coupled by the '**Stop Climate Chaos**' coalition in which more than 100 diverse NGOs participated, the campaign forced the UK government back then into voting in **a Climate Change Act** with statutory targets for annual emissions reductions.

To institute such a broad, radical economic-ecological transformation, the Welsh Government should **determine the direction of change** carefully choosing mission-oriented policies; **invest on shaping and creating markets**, rather than just fixing them and responding to market failures; and, **immerse in risk-taking** both to

reap the rewards and to enhance learning, and future expertise and capacity. This amounts to a substantial switch from a regulatory, conservative in its posturing and managerial model, to the innovate, risk-taking, and more interventionist blueprint. The potential for such a transformative strategy is higher when the state does not rely on heavy command-and-control, top-down policies, but establishes and nurtures a decentralised structure in which organisations can develop, customise their operations, collaborate efficiently and adapt to changing circumstances. The proposal for the establishment of an energy company for Wales with different arms and diverse functions rhymes with such an understanding. Although it has been **rejected by the Welsh Government for now**, a strong case can be put forward that the state must put in place **an umbrella company to steer the transition, accelerate its pace and mend the gaps a market-based approach entails**. This proposal is fully set out in section 10.1.

Indeed, contrary to widely held beliefs that innovation can only emanate from private initiative, the most defining breakthroughs of the last decades have sprung from public entrepreneurship, or public-private partnerships. The Internet developed out of the US state's ARPANET scheme; the shale industry that boomed in the 2010s has been systematically supported by public money and schemes since the 1970s; and, it was the Chinese government's resolve to respond to climate change and acquire the niche in a new technological frontier that led to an exponential curtailment of costs of solar power generation. China's initiative not only outcompeted private companies around the world, but also fundamentally redefined the economics of the industry, as well as what is considered possible in both economic and climate terms.

This point is critical for the design and implementation of far-reaching climate policy. The neo-liberal legacy into the 21st century means that most governments around the world still work on the assumption that markets will deliver; state intervention is appropriate only to correct market failures; and the ownership and benefits flowing from innovation can only be in private, rather than public hands. Not only do these theoretical assumptions fall short of the workings in the real world, but the state can effect much more rapid and effective change if it owns innovation and economic change; picks up technologies, the games to be played and partners from the private sphere; learns from its experiences; upgrades its management skills; and, becomes the pioneer in the all-encompassing field of climate policy, where markets have evidently failed to deliver. In fact, one reason that all formal advice remains circumscribed in its ambition compared to climate imperatives is that it works on the assumption that business must be responsive to policy, and so the policy can only go some way so as not to upset the market. Other reasons have to do with the workings, politics and political nature of expert advice (see Box 3).

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Box 3. Political advice and climate goal-setting

It is usual for authoritative committees to remain conservative in their outlook in cases of fierce uncertainty and too many variables and unknown unknowns, as is the case with climate policy. **Experts are usually pressed to downplay uncertainty, narrow down the richness of perspectives and provide regardless tailor-made policy recommendations that are workable for policy-makers**. In this context, it is no surprise that more conservative pathways are chosen. Indeed, the IPCC's predictions regarding the scale and scope of climate change have proved to be rather conservative. The UK Committee on Climate Change, moreover, itself states that it prefers to operate within safe and already considered feasible boundaries. Nevertheless, the UK Committee on Climate Change also asserts that more effective climate policy is possible today, in case the '**mass roll-out of currently niche technologies leads to rapid cost reductions**', a tendency already in place, and because '**the range of options could be wider and/or cheaper than we have assumed**'. In this context, more ambitious targets may be equally feasible. **Technocratic governance**, however, is geared to cling to a **system-perspective**, with the system's perpetuation and optimisation the main goal. This means that more often than not **the problems are identified and defined in such a way as to match pre-given solutions, rather than to point to essential solutions that entail system disruption**.

More importantly, the setting of targets is fundamentally political, as it not only responds to, but also shapes, understandings as to what is feasible. Higher targets will mean greater mobilisation to mitigate climate change as opposed to lower ones. Moreover, while mediocre climate goals and carbon budgets are set, climate change disruption and consequences, as well as further learning and potential to deliver on the climate front, rumps up. **The feedback loops between new evidence, updated policy design and policy implementation amount to precious wasted time and restrain climate action, and hence work to the detriment of climate policy**. Pressing climate timetables thus render the classic method of evidence collection and certainty formation biased against effective climate policy and hence counter-productive. In this context, it appears to be preferable to set ambitious policy that can not only benefit from continually developing experience and capacity, but also more vibrantly encourage climate mitigation potential, among others through more risk-taking by the state as argued above.

PART II: RESHUFFLING WELSH CLIMATE POLICY

6. Undercutting themes of climate policy

6.1. Climate policy and growth

While the WFGA positions sustainability at the core of policy-making focus, its interplay with the other public policy goals is not automatically clear. Far from that, the entrenched fixation with economic growth, the natural preoccupation with employment and the goal of higher welfare standards often lead to an either/ or debate. Sustainability in this context can suffer, its importance may be relegated, and the letter and spirit of the key WFGA may be left unobserved.

Climate change is principally an energy problem, as the fossil fuels that run the economy are also the main culprit for climate change. Hence, since the very basis of our economy is unsustainable, **a certain trade-off seems to be at play**. Either a strong sustainability turn is taken and the economy may suffer some contraction, or the growth imperative retains a stronghold and determines the pace of sustainability-targeting reforms. Indeed, this is the current state of play, increasingly at odds with climate science and pressing timetables for ecological-economic transformation.

To be sure, **the energy transition can also foster further growth** (PDF 2.97MB). The case of the clean energy industry across the supply chain constitutes an indicative example. Moreover, novel sustainable economic structures and business models can emerge without necessarily downscaling growth. The switch to a circular macro-economic model and to service- rather than commodity-based business models provide useful cues (see section 9.1.).

Nevertheless, and besides reaping these 'low hanging fruits', **the overhaul of the energy and economic system may have some repercussions on growth (**PDF **2.97MB), especially if renewables investments return lower electricity flows than anticipated**. While the UK Committee on Climate Change boasts that the UK case proves that growth can go hand in hand with decarbonisation, two caveats need to be pointed out. First, growth is linked to lower emissions within the territory of the UK**; the UK economy, nevertheless, bears a much higher carbon footprint if imports are added. In that case, UK emissions are 70% higher.** This differential explains to a great extent the margin for UK growth. Growth, then, does not go hand in hand with decarbonisation, but is actually fed by the unsustainable use of fossil

fuels. Secondly, present growth under shallow decarbonisation does not prove that growth will remain unaffected by deep decarbonisation as well, as a certain trade-off is at play.

In fact, growth reduction as a result of deep decarbonisation is seen as a red line for policy-makers, and the most central barrier to drastic climate action. The growth discussion, hence, merits some further qualification. First of all, **growth fails to ensure the rise in welfare anticipated** on the background of past experience; growth rates nowadays yield more marginal positive reverberations on other welfare indexes, such as employment, wages, equality etc. for a plethora of reasons including competitive (labour) markets, technological advances, outdated business models etc. Secondly, growth may no more be feasible, especially for the Global North. In case we have entered a **phase of secular stagnation**, and **low-growth becomes the new normal**, an alternative economic and developmental blueprint is the only option available.

At the same time, **the Gross Domestic Product (GDP) Index for measuring growth has come under severe critique for economic oblivion, as well as for its stark failure to account for ecological and social parameters**. Mainstream literature has thus moved to complement it with **the notion of wealth,** understood as stretching beyond productivity to encompass the management of a broad portfolio of assets, including produced, human, and natural capital. This, however, remains short of providing a full accounting index of countries' wealth, not least as it still undermines the central role of natural capital, as well as the costs incurred by higher GDP indexes (which the GDP index absurdly measures as positive). Ecological economists, to the contrary, have long advised in favour of a **threefold accounting system** that comprises:

- a benefits account, similar to GDP;
- a costs account, incorporating costs incurred from economic activity, such as deforestation; and
- the remaining natural capital, in which carbon space holds a prominent place, indispensable for future economic activity.

Such a combined wealth and costs accounting system would not only portray and reveal a different picture of countries' wealth, but also give natural capital the prominent role it deserves; notify policy-makers of account imbalances; and, steer policy towards sustainable, rather than overshoot, welfare. In fact, the application of such accounting has shown that many Western states have failed to enjoy higher welfare levels the last decades, *despite* rising growth. This means that a **switch in the focus from growth to sustainable welfare can undo the growth-induced losses, generate more social benefits of an unmonetisable nature** (such as leisure

and quality time, more time for care etc.) and, more critically, yield a safe biophysical environment.

Climate policy, however, is obstinately weighed against the costs it entails measured in GDP units. Rather than emphasising both monetary and hard to monetise benefits, which remain measured in indexes regarded as inferior to the central GDP index, climate policy discourse remains mired in the distorting GDP-based discussion of its feasibility and desirability. The calculated 1-2% of UK GDP cost of climate policy hence remains a critical barrier to a more proactive climate agenda. This discursive dominance perpetuates a growth-GDP-centric fallacy and disorients from the essential task of retaining healthy, resilient ecosystems in which humans can thrive.

In all, the pressing timetable for climate action; the rising costs that climate inaction entails; the progressively marginal benefits of, increasing barriers to, and pitfalls of growth; the downsides of the GDP-based accounting system; and, the central status of sustainability as enshrined in the WFGA, all mandate that **Wales must forcefully consider prioritising a sustainable welfare, rather than growth, economy**. Wales has a lot to gain from a systematic effort to experiment with **'eco-localisation as a progressive response to climate change'** and move towards **eco-restructuring and designing a 'distinctive low-carbon polity'** (PDF 185KB).

6.2. Climate policy and inequality

Climate policy can both increase inequality, or serve as a platform and policy vehicle for lowering inequality. In the first case, climate policy is tied to economic incentives that the have-nots can usually not tap on. For example, a scheme to connect energy efficient homes with lower council tax bills plays to climate goals, as it may well boost the market for energy efficient homes. The absurd outcome, though, is that these rebates will benefit the most affluent, and enlarge the gap with the have-nots, who cannot possibly benefit from such a scheme. For this reason, public policy in respect to climate goals has to be sensitive to inequality implications and reverberations.

To the contrary, climate policy can be a springboard for more equality, if it starts from targeting the least-well off, while obliging the affluent to contribute their fair share in climate policy. This stems from the understanding that the carbon space is a collectively owned public good, of which the most affluent have more than their fair share. They should hence help offset (through their higher taxes) the least well-offs' emissions and enable the gradual lowering of their carbon usage.

On this basis, and taking into account that equality is one of the goals of the WFGA,

climate policy must not just be designed with caution not to exacerbate inequalities, but also with an eye to promote equality. This translates into:

- focused measures to support the least-well off in binary climate-social policy ways. Vulnerable households, including households facing energy poverty, and social housing need to be prioritised, as provided also in the **updated EU directive on energy efficiency** (PDF 2.73MB), irrespective of whether Britain leaves the EU, or not;
- proportional support to the most affluent which will incentivise renewables uptake without increasing their relative wealth vis-à-vis the least well-off; and
- strengthened social corporate responsibility to share in the costs of the energy transition, rather than be subsidised through taxpayers' money.

7. Energy transition pathways

7.1. Centralised and decentralised energy architectures

The default way for implementing the energy transition has been to mimic the top-down policy model of market creation in the renewables sector. In this context, the emphasis has been upon incentivising big energy players to invest in extensive renewable energy generation facilities (such as wind and solar parks) in order to substitute fossil with clean energy. Despite the breakthrough of the 1999 devolution and the increase in devolved competences over time, **Wales perpetuates this top-down model of energy transition and a centralised energy architecture, which however makes less sense for renewable energy.**

In fact, the properties of renewable energy make local scales more appropriate for the production, transmission and consumption of energy. This reality fits in well with the WFGA's principle of involvement and citizen engagement and participation in public policy implementation. These legal grounds provide a **strong case for a decentralised, distributed energy model of transition for Wales**. In this architecture, the role of citizens in co-shaping, participating in and boosting the energy transition is central.

In 2017, locally owned renewable capacity was around one fifth of the total and **amounted to 750MW**. **The Welsh Government's target for 2030, set at 1GW**, is evidently hardly ambitious. **The Welsh Government's provisions that from 2020 all new renewable capacity must have an element of local ownership**, moreover, is rather vague and calls for further refinement.

In general, emissions from the residential sector, the sector where citizen participation is easier to implement, can go down exponentially in case citizens are encouraged and actively supported to makeshift their homes into (near) zero-carbon through retro-fitting, renewable energy facilities, as well as demand-side measures within a smart grid. Benefits can spill-over to the critical transport sector through sector coupling with electro-mobility. Cars can function as batteries that store the energy smart houses produce overnight and hence fuel both residential and (part of the) transport needs.

An increased emphasis on citizens and communities as co-producers of energy does not negate the centralised potential for renewable energy generation. To the contrary, Wales is well endowed to host bulky renewables facilities, such as wind and tidal parks. This, however, should not obscure the bottom-up potential of the energy transition, which will empower and benefit people and local communities directly.

Renewables parks are a perfect fit for feeding Welsh industries, the rest of the UK, or even regional export markets as a means to generate further revenues and bolster the Welsh budget.

7.2. Energy markets, prosumers and decommodification

A further undercutting theme regards the role of the markets (including ownership structures and modes of transaction) in the energy transition. Contrary to traditional fuels that became widely commodified, **renewables lend themselves to different business models, spanning across a continuum from commercial, profit-making models to exploitation for own use and for the purpose of covering one's own needs, and reaching as far as decommodification**. While in a centralised renewables market profitability remains key, decentralised energy systems can be organised both on a profitability and decommodified basis. In the first case, citizens, local communities and non-energy corporate actors become prosumers, potentially covering part of their own energy needs through self-consumption, and selling the rest to the central grid in order to generate profits and resume their sunk costs. In the second case, citizens, local communities and non-energy corporate actors use the energy they self-generate and share it in the grid for storage and flexibility purposes, rather than to generate profit.

These models, the centralised and decentralised one, and the market or decommodified variants of the de-centralised energy model, have different implications for growth, prosperity and the state of equality. While a bottom-up decommodified model is about meeting energy needs, and hence fosters solidarity, social capital and more equality, a market-based bottom-up model may foster growth but leave inequalities intact, or even enlarge them. The same is the case with a centralised model of energy transition.

These models are also expected to generate different climate outcomes, depending on how profound an energy transition they lead. In general, the centralised market-based energy transition model has failed to attract investments at a scale commensurate with the goals for renewable energy increase and for proportional substitution of fossil fuels. Incentives given to harness the bottom-up model, on the other hand, have been scarce and poor. As a result, they have failed to lure into the transition the critical mass of people, as regulation approaches people as investors and presupposes that they have both the means and the will to invest in clean energy. Innovative and generous funding and information schemes hence are required in order to bolster a bottom-up energy transition, render citizens the agents of transition, the drivers of emissions reductions, and prosumers of clean energy, irrespective of whether prosumption will be market-based or will go hand in hand with energy

decommodification.

In all, Wales can choose between:

- a more progressive climate agenda and a more limited climate policy to the extent that it does not undermine growth;
- a largely top-down or bottom-up model of energy transition;
- a market based or decommodified variant of a bottom-up energy transition; and
- utilising climate policy as a vehicle for more equality, or not.

On the grounds of the WFGA:

- Wales needs to target sustainable welfare in line with pressing climate imperatives. This means that it needs to disentangle its climate policy from the growth imperative and put in place tight carbon budgets that may compromise it. Extra caution should be given that economic losses do not translate into welfare losses. Distributive and compensatory mechanisms may be necessary to achieve this, in particular regarding job creation.
- The energy transition must have a clear bottom-up component, premised upon citizen engagement and participation in both energy production and decision-making. This still leaves ample room for centralised clean energy production schemes.
- The variant of the bottom-up energy transition model remains up for grabs and can be decided upon with reference to the country's overall strategic vision and the place of market relations within it.

8. What it all comes down to: a concise plan and decarbonisation pathways

Adjusting climate action to the 1.5 degree Celsius increase goal, Wales must aspire to carbon neutrality before 2050, in line with the cascading effects of emissions concentration in the atmosphere. Urgent action to upscale the energy transition thus is required, setting forth the need for more ambitious goals, and proportionately tighter budgets.

The roadmap presented below is more ambitious than the UK Committee on Climate Change's for a number of reasons (see section 5.3.):

- The level of climate goals is critical for the scope of climate mobilisation and climate performance. More ambitious goals will spearhead more ambitious policy, which, in turn, will provide exactly what the business community anticipates: regulatory stability, long-term horizons and proportional support schemes. These will allow businesses and citizens to adjust/ upscale the level of investments in different fields/ activities (with energy efficiency and renewables standing out). Higher climate ambition is catalytic in providing solid signals for the future direction of the economy in the 21st century and has the potential to lead to a much more swift energy transition.
- This report factors in technological developments and cost reductions as policy evolves, in dynamic rather than static terms in other words, that render a carbon-neutral economy possible in shorter time-frames. The implementation of global best practices, in the background of a more nuanced and balanced conceptual framework guiding economic priorities and targets, allows space for a faster, upscaled clean energy transition.
- The upscaling of citizen engagement in the decarbonisation enterprise, as mandated by the WFGA, can enlarge the scope and proliferate the pace of the energy transition.
- The imminent energy-emissions trap (see section 5.1.) makes shorter time-frames more appropriate for climate change mitigation and energy security purposes.

In this mindset, a fast-track downscaling of Wales' carbon footprint necessarily implies that:

- a moratorium on coal must be put in place. **The Aberthaw coal-fired power plant, in particular, in regards to which governmental ambiguity persists**, needs to be shut down by 2020 contributing imminently to the emissions reduction goal. A **'coal exit Commission'** can be established to institutionally lock-in this process;
- there is no place for unconventional energy, including shale oil and gas;
- oil should be phased out well before the 2040s;
- natural gas (not including shale/ unconventional gas) should become the actual fuel-in-transition roughly for the next two decades;
- nuclear energy supply can continue in line with existing plants' lifetimes. New nuclear projects, however, stumble against too high costs to ensure health and safety;
- no new fossil-fuelled plants should come onstream, as they will either lock-in fossil consumption in the long term, or constitute disastrous economic decisions since they will have to come offstream before sunk costs can be resumed. The Aberthaw plant is a good case in point. **Responsible for 37% of Welsh power emissions and 12% of total Welsh emissions in 2016,** its climate footprint mandates its premature closure despite significant economic costs. In the same context, **the goal of bringing onstream new gas generation capacity over 350MW** is either devoid of long-term economic logic or dissonant with climate goals.

The above refer to ending the catastrophic climate legacy of the fossil era, but do not shed light on the whereabouts of a sustainable economy. Indeed, what is urgently needed is a **strategic energy plan** that will delineate how much renewable energy needs to be generated to make up for the entire fossil consumption, which has to be regulated out well before 2050 in line with climate imperatives. In what follows, a brief sectoral-based roadmap is presented for drastic emissions reductions in Wales.

- **Power –** Wales must decide in the very short term what energy pathway it prefers to follow. It must strengthen grid capacity accordingly, and provide immense motives for the generation of centralised and decentralised renewable energy in the balance it wishes. Wales should design a detailed plan of how much renewable energy it will need to produce for every carbon budget. These calculations have to be formed on the basis of an abrupt (quicker than currently scheduled) coal phase-out and the

concomitant resolve not to build further gas plants that will only lock-in gas use for decades against climate imperatives. Bulky renewable capacity is well within the remit of countries undergoing an energy transition, as is manifest by the frequent **negative electricity prices**, caused by higher than predicted renewable energy generation, central Europe faces. Crucially, carbon capture and storage (CCS) should be discouraged due to its clash with other land uses and high energy intensity, high economic costs implicated and broader health and environmental risks. Its premature stage of development, moreover, far from guarantees successful roll-out, nor provides the indispensable attached environmental and safety safeguards. In terms of energy potential, then, Wales must heavily invest on clean energy sources. As the recent **Report of the Institute of Welsh Affairs *Re-energising Wales*** project showcases, full decarbonisation no later than 2035 is feasible.

- **Transport – Transport emissions derive largely from long commutes**. Hence, the emphasis on active travel and behavioural change will not amount to much, unless it is supplemented by the granting of new options to commuters/ travellers. The only viable way forward is a comprehensive plan for transport that will include the South Wales Metro; the overhaul of infrastructure to accommodate multiple charging points in functional proximity to one another; and the tying in of residential renewable energy generation facilities with plug-in electric cars. This transport system should be deployed within the 2020s, and be fully (nation-wide) operational by the 2030s. At this point, there will no end use for oil.
- **Industry –** The **Economic Action Plan and the Economic Contract** should provide a much more powerful sticks and carrots framework to discourage unsustainable practices and nudge sustainable ones. The broad adoption of a circular corporate economic model (see section 9.1.) and the addition of renewable energy supply, demand management and energy efficiency as indispensable pillars of business models should be the goal for the Welsh Government within the 2020s. The possibility, rather than assumed certainty, that this may lead to carbon leakage should not serve as an impediment to a holistic restructuring of the Welsh economy.
- **Buildings –** The residential sector is central in emissions reductions in three ways. First, residential emissions can drop substantially by initiatives to enforce higher energy efficiency standards (both regarding insulation as well as in-home appliances). Secondly, buildings can yield energy demand

reduction or add to grid capacity by means of residential renewable energy generation facilities, as well as by feeding with electricity, and thus neutralising, the transport sector. Thirdly, corporate sourcing of substantial amounts of renewable energy is essential. Institutions such as universities and hospitals can play a pivotal role in setting examples and evidencing best practices, adding to grid capacity and reducing overall energy demand and thus emissions. The overhaul of the buildings sector should be completed by the early or mid-2030s.

- **Waste management –** There are two priorities here. Reducing landfill is tantamount to emissions reductions. On top of that, waste can generate renewable energy, thus indirectly contributing further to emissions reductions. Significant opportunities exist here for industries, not least through clustering. The sector can be carbon positive in the near future, no later than the early 2030s.
- **Agriculture and land use –** The adoption of waste-to-energy technologies and a circular economic model in agriculture are the two central ways to reduce emissions. As many of the emissions produced in agriculture are natural, this is the only sector where some emissions are acceptable; these are expected to be offset by the workings of carbon sinks, primarily through intensive afforestation.

9. Reaping co-benefits across the public policy nexus: best practices and evidence from around the world

The bundling approach introduced in section 5.2. allows policy-makers to focus on the co-benefits climate policy can produce across the board, thus strengthening the case for a more proactive and extensive climate policy across sectors. In particular, a forceful climate policy can produce substantial economic, health and social policy, and energy security co-benefits. It is critical to point out that these are both missed in the absence of a proactive climate policy, as well as that the costs and risks implicated in current economic, health, social and energy security policies remain high despite the space for much cost-efficiency through climate measures. Secondly, a more proactive and extensive climate policy can also set in motion the much needed transformation of the economy and facilitate the design of novel business models that are a better fit for an economy under biophysical stress.

9.1. Economic co-benefits

Fossil energy imports devour a substantial chunk of foreign exchange. An ambitious climate policy aims directly at the curtailment of fossil imports to effect drastic emissions reductions and, hence, leads to substantial foreign exchange savings. In contrast to fossil imports that constitute outflow of money and a significant burden for trade and payments balances, renewable energy, as a substitute to fossil imports, can be generated at home. Energy efficiency is also a local business. This carries a number of **important economic advantages**, including:

- more local economic activity across the clean energy supply chain;
- higher employment and boosting of wages;
- a concomitant skills acquisition;
- the re-spending of (most of) the locally generated money will further empower the local economy multiplying aggregate demand and overall disposable income;
- the potential for the creation of a new export industry (perhaps specialising in specific areas across the supply chain); and
- higher taxes paid back to the public cashiers, which can further finance public policy.

Germany's **Energiewende** reflects these priorities both in design and as outcomes. China's pronounced turn to a more ambitious climate policy the last decade also chimes with its intent to become a global leader in solar technology. At the current critical juncture when the economy is under profound transformation, states that

become pioneers in the emergent clean energy industry tend to benefit the most, while latecomers will entertain fewer benefits.

Secondly, and within a limited carbon budget, national economies have incentives to **remain competitive by downscaling their carbon footprint**. Climate change thus mandates a **circular economic model,** which can sustain more material wealth, in stark contrast to the contemporary throwaway economic model that undervalues resources and generates plenty waste. In a circular economic model, resources are properly valued as inputs, used in the economy, and then returned either to the economy as raw materials (through reuse or recycle), or as nutrients to the biosphere. This model is directly applicable to fuelling agriculture, industry and district heating, by turning waste into energy.

This circular macro-economic model must feed in the microeconomy, enabling and nudging **business models that are a closer fit for a world of limited carbon space**. The means to effect such course of change of corporate behaviour is **tax cuts/ credits for low-carbon companies**. This should be enough for big and liquid corporate actors to become less carbon-intensive; for small and medium size enterprises (SMEs), **zero-interest loans** would be necessary alongside tax cuts to enable them to adopt a greener energy portfolio. This way corporate actors could focus besides their core business into **minimising carbon use and maximising gains from lower carbon consumption, in line with an increasingly limited carbon space.**

In a UK context, efforts have focused on commercialising CCS technology. **The partnership between UK universities and the iron and steel industry with the goal to render the latter carbon neutral by 2040** is a case in point. Nevertheless, it is important to underline the strong caveats that persist in regards to these moves, since technologies remain immature and associated economic, environmental and health risks paramount. CCS also means that fossil fuel use remains rampant, cancelling out the many economic benefits fossil divestment entails for the economy, as set out above.

Corporate investments on clean energy parks to fuel industrial activity, on the other hand, are more risk-free and hence a safer bet and investment. A number of institutions, such as universities and hospitals, are well-placed to follow such a strategy with an eye to contribute to climate change mitigation, and reap both associated economic benefits and improved public profile gains. The **University of Exeter's clean energy plan** constitutes a prime example in this direction.

Moreover, current business models have been designed for a previous era, in which natural capital was undervalued. Factoring in the increased value of resources and lower emissions can recalibrate these business models in a more sustainable trajectory. For example**, IT retail companies could shift to a leasing business model** (PDF 2.97MB), where they lease personal computers and laptops for certain periods, but retain their ownership so that when customers wish to switch, or IT equipment is underperforming, IT companies can fix/ maintain them and eventually either recycle them or responsibly treat the waste. **This serves the needs of the people, allows even higher profits for the companies, and collectively brings down the number of materials needed (and the energy they require for their assembly/ function etc.)**. Moreover, it leads to **more responsible waste treatment** compared to the appalling extant situation whereby electronic waste (e-waste) is dumped on sites of the Global South in the least responsible and hence ecologically most burdening way. However, companies do not have much incentive to change a profitable business model in the absence of concomitant regulation. An eco-tax reform or low-carbon credits would nudge them to do so.

An even more indicative example comes from the energy sector. **Utilities**' core business model lies in purchasing energy and selling it back to consumers at a profit. Rather than remaining (in most cases dirty) energy traders, utilities and retail energy companies **could turn into auditors of their customers' energy performance**. In this role, they can detect the opportunities for energy savings, finance the substitution of the least energy efficient appliances with efficient ones and charge higher prices per unit of energy. **Sacramento** (PDF 2.97MB) has successfully implemented such a policy decades ago. This is a win-win case, as

- Consumers would see no difference to their bills (or benefit from lower bills depending on the utility's strategy), as they would be charged a higher price per unit of energy but would overall consume fewer units;
- Utilities would maintain or even increase their profits, not least as they would require fewer energy purchases and hence suffer less exposure to global energy markets; and
- As a result, emissions would decrease considerably, without any economic losses for neither the energy incumbents, nor the consumers.

In all, substantial economic co-benefits arise from an ambitious climate policy, as long as the focus is upon:

- nurturing the potential of the clean energy industry;
- switching from the throwaway to a circular economy; and
- encouraging different business models via tax instruments and zero-interest rates.

9.2. Health and social co-benefits

NHS Wales is under formidable and unprecedented stress. The standard approach has been to endeavour to finance NHS Wales more generously, and in so doing starve local councils and state budgets, in line with people's justified requests. An **alternative approach is to aim at combating not the symptoms, but the very sources of poor health**. It is at this point that climate and health policy conjoin.

Growing emissions deteriorate the state of air quality, leading to poorer human health, being responsible for an increased number of cardiovascular episodes and cancer. **A climate policy that would drastically limit emissions and proportionately improve air quality would have a far-fetched positive impact on human health and public finance**. Further economic co-benefits also arise, as improved health also translates into fewer working days lost to diseases and higher productivity.

Canada's **Ontario** has taken such an approach viewing poor air quality as a health issue to be tackled by means of climate policy. This approach had profound results. Ontario endorsed a massive program of renewable energy generation and energy efficiency, which allowed it to largely displace fossil energy-induced emissions. Besides achieving bold climate goals, Ontario also saved on health-related expenses, as well as contributed to its citizens' health and the economy's productivity (PDF 1.82MB). Health and climate policy can be designed synergistically, providing a win-win case for policy-makers.

Climate-related health risks, moreover, are only aggravated the more climate change remains inadequately mitigated. In the US, for example, **mosquito 'disease danger days' have proliferated**, putting Americans in higher, more prolonged risk and inducing further costs to the US health system. This makes a joined up, pre-emptive climate and health policy imperative.

Climate policy can also provide critical social benefits to the extent that it can battle energy (fuel) poverty. Energy poverty constitutes a hard to overstate burden on the least well-off and society by and large. This is because energy expenses take up a disproportionate share of poor households' budget, making it very hard for them

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to make ends meet. People living in energy poverty are also eligible for a number of social benefits, which burden the public budget. **Combating energy poverty at source** (PDF 1.82MB) by financing energy efficiency and renewable energy facilities would be much more economical in the long term, liberating the state from a number of benefits to be paid. To the extent that energy poverty is a structural factor that hinders employability, its combat would also improve the employment prospects of the least well-off. This would additionally impact favourably upon the labour market and the wider economy's competitiveness. Furthermore, and to the extent that poor economic conditions are associated with anti-social, delinquent and criminal behaviour, such climate-social policy measures could also release more resources off the starved police forces.

In all, climate policy can:

- contribute to a healthier Wales in the most cost-efficient way; and
- minimise social costs through targeted measures to combat energy poverty.

9.3. Energy security co-benefits

Energy security, understood as supply security at affordable prices within a strict carbon budget, is central to states' welfare. This is because, first, threats to energy security could paralyse the state thus inviting foreign interventions and, secondly, energy crises create formidable economic conditions, hampering welfare.

Energy security then is about the resilience of an economy to meet its energy needs and not suffer any economic setbacks in light of energy shortages. In this context, **the more direct, national and local sourcing of energy seems a quicker route to energy security compared to the volatile global oil and globalising Eurasian regional gas market** from which Wales sources most of its gas. This is so because:

- Exposure to these markets' boom-and-bust cycles retains a high risk of skyrocketing oil and gas prices once every few years;
- Dependence on unreliable exporters reduces energy and economic resilience; and
- Importing states, including the UK, utilise storage capacity and a large transport and transmission infrastructure to mitigate such effects, which however adds to

overall energy costs and final retail prices.

To the contrary, **energy security is much better served through renewable fuels and clean-based energy sources**. More specifically:

- Local, national and regional renewable energy systems are more reliable in the sense that they do not depend on distant, complex and often invisible market forces, geopolitical interests and concomitant manipulation;
- States can invest on clean energy in line with their energy endowments and needs, set up their own clean electricity systems, strategically decide on their interlinkages and interdependencies, and reshape their energy systems in a more transparent, manageable and predictable way;
- Demand-side policies have a pivotal role in this enterprise, as they will decrease demand for energy, prioritise energy efficiency, and thus bring overall energy demand down, thus supressing both associated investment costs and exposure to traditional fossil and renewable energy risks;
- Dependence on imports of clean energy materials is far less cumbersome and problematic in that they are of an one-off nature, as opposed to the need for ubiquitous flows of oil and gas; and
- Dependence on electricity flows within regional systems, moreover, is less of an issue, as imports of electricity are less prone to disruption compared to gas due to the properties of electricity.

It should be stressed that this analysis does not hold for decarbonisation that passes through CCS. In that case, risks and costs remain as is the case today, since energy supply is still premised upon mostly imported fossil fuels, although their emissions become stored. This provides a further argument, from an energy security standpoint, as to the preferential pathways to decarbonisation and sustainability.

In the case that a smart grid is established, finally, it should be stressed that this represents a serious cyber-security risk. Smart grids will hence demand a further layer of expenses to hedge against such risks. These expenses have to be factored in the decision to opt for a smart grid, or for alternative energy configurations, such as stand-alone, off-grid and mini-grid systems.

10. Recalibrating proposals on the table

Drawing both from the above discussion, as well as from long-standing debates within the Welsh policy-making contours and public sphere, this section critically discusses one climate policy proposal on the table and one ongoing energy and climate scheme. It recalibrates them so that they can both enable the design and serve the implementation of tighter carbon budgets.

10.1. An energy company for Wales

Energy transitions are supply and market-driven. They hence respond to policy and regulatory incentives and market signals to create profitability margins in line with lowering emissions. As a result, some crucial aspects of the energy transition, such as energy demand and consumption reduction, energy efficiency and savings, and demand management remain substantially downplayed. The role for a public energy company is to promote such aspects, gear the transition into the much needed demand-side direction and design a holistic plan for the substitution of the old fossil energy infrastructure with a clean and smart energy system in line with climate imperatives.

The proposal for an energy company for Wales in particular has attracted sizeable attention, and lent itself to democratic, discursive processes. What Wales does not need is an energy company focusing on supply, entering the market, playing the role of and competing with established market players, burdening the public purse with implicated costs and jeopardising taxpayers' money. What Wales needs is an umbrella company that focuses on energy demand management and consumption reduction, energy efficiency and savings, and investments on clean energy sources and systems to upscale and fast-track the energy transition.

To do so, the new energy company needs to focus on four concrete areas in order to fill the gaps and cracks within the extant energy landscape and address market failures. More specifically, it should:

- supervise energy auditing or itself audit consumers' energy performance and put in place energy efficiency measures;
- promote demand management that is emphatically lacking from energy transition plans;
- take up an active regulatory role in an emergent Welsh supergrid;

- steer, design and implement the strategic trajectory of the Welsh energy transition; and
- enhance the swift generation of renewable energy serving as the entry point and one-stop-shop for all stakeholders.

In line with the successful blueprint of Sacramento outlined above, the new energy company must promote reduction of energy consumption. The first step would be to allow energy companies a short period in which they can delve into auditing their customers' energy performance and accordingly finance the substitution of their appliances. The public campaign should also render crystal clear that it is to customers' interest to have their company audit their energy performance, and hence nudge companies to do so in fear for losing customers that will switch to other energy companies applying the auditing scheme. In these cases in which energy companies fail to act, the new energy company should intervene and enforce this plan. Energy companies stand to lose in this case, since they will see their customer base shrink and profits go down. The positive side-effect of this scheme is the demand that will be created for the most energy efficient appliances, which will lead to a short boom in associated sectors and yield profits across the supply chain.

Secondly, the roll-out of smart meters and smart grids takes place at a UK-wide level, but at dishearteningly slow paces. This lies in stark contrast to other states, like Italy for example, where the roll-out is virtually complete. The new energy company can take up an active role in the smart meters' roll-out as a necessary tool in demand side management, by operating, for example, fines to energy companies not complying with established deadlines. At the same time, it should educate consumers of the virtues of the new system, familiarise them with the opportunities, options and novel tariffs available, and incentivise their active take-up and use to harness substantial energy savings. Information campaigns and seminars should take place as soon as possible, so that consumers are in position to take stock of the smartening of energy systems.

At the same time, thirdly, the new energy company should take up an active regulatory stand in order to foster the finetuning of local production and consumption, and prepare plans for a Welsh clean energy supergrid that will cover the whole of Welsh needs in the medium term. This also expands to the establishment and governance of local energy hubs, the fostering of storage solutions to provide flexibility and resilience to the Welsh supergrid, and sector coupling with electro-mobility.

The above call for the fourth competence of the new energy company**, the design of a strategic plan for the scale of renewable energy generation in Wales in the next two to three decades. On the basis of reduced energy consumption,**

the net capacity to substitute fossil energy in the next two to three decades must be calculated and a proportionate plan put in place for the generation of renewable energy. Individual prosumers, community energy stakeholders and corporations should consult with the public energy company that will be able, fifthly, to give the go ahead for renewable energy generation plans. Wales can also plan in the near future for generating extra capacity for export purposes. This strategic plan can be understood as building upon the **Bridgend Energy Catapult that uses the Energy Path Network Tool**, but expanding beyond heat to a multi-vector approach, operating at the national level, and providing for the much needed energy systems approach for the whole of Wales.

To achieve these goals, the new energy company will need three distinct arms:

- a funding facility, akin to **Scotland's Climate Challenge Fund**, co-financing energy schemes and providing zero-interest loans to foster renewable energy generation and energy efficiency measures;
- a Distribution System Operator for the Welsh supergrid, that will take up smart meters' roll-out, and coordinate Welsh renewable energy production and consumption, as well as supplies to the rest of the UK through network linkages; and
- a research and technology centre that will focus on promoting fit-for-purpose innovation, with an emphasis on storage and electro-mobility solutions in the Welsh context. These are critical to enhance the smooth functioning of a 100% clean energy-fuelled grid, and to bring emissions down drastically from the transport sector. Open channels of cooperation with the **International Renewable Energy Agency (IRENA)** will be invaluable in tapping on associated expertise and streamlining innovative projects in the Welsh context.

10.2. A more engaging approach to the Zone Demarcation Scheme

The Welsh renewable energy policy has been premised since the mid-2000s upon the **Zone Demarcation Scheme**. This planning scheme was designed in the hope to streamline procedures for investors to invest heavily in the renewables sector. Nevertheless, **the concerns and interests of affected communities were ignored/ heavily disregarded, together with the projects' adverse environmental and social repercussions. Reasonably,**

these schemes met with local resistance with the effect that renewable generation has been stalled, and hence been overall meagre compared to initial hopes.

This highlights that a more engaging approach is necessary. As enshrined in the WFGA, people should be involved, their opinion asked for and listened to and their judgements as lay people seriously taken into account. At the same time, it is irrational to expect local communities to adhere to business plans that entail certain downsides (such as aesthetic and biodiversity losses), but do not produce direct economic and social benefits for them. Novel corporate strategies and business plans are thus necessary, in which local communities become active stakeholders. Communities' engagement can take various forms, such as communities becoming co-investors, or recipients of a sizable rate of returns and/ or guarantees for local employment, local reinvestments etc. To the extent that such strings attached undermine corporate profitability and undercut investors' eagerness to invest, local communities could step up and themselves become energy generators. In fact, municipal utilities have mushroomed across Germany and central-northern Europe the last fifteen years, providing both successful blueprints and associated know-how and best practices.

The role of an energy company for Wales in actively assisting local communities to become energy generators is critical and expands across all stages: planning, financing, implementation, assessment and maintenance. With the help and expertise of a Welsh energy company, it is likely that both private investments, public-private partnerships and community energy schemes can mushroom, transforming Wales into a green hub.

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11. Brexit's adverse impact

The yet unknown terms and timetable for Brexit add a further layer of contingencies and raise a number of further concerns in regards to Welsh climate policy. First of all, the turn from fossil to renewable energy is, for both technical and economic reasons, consonant with the **regionalisation of energy relations**. In this context, supergrids can unite different regions; this, however, calls for hardware (infrastructure) and software (regulation) that allows for and fosters interconnectivity. The oscillation from a hard Brexit to remaining within the EU Economic Area (EEA) allows no certainty as to the UK's part in such a future enterprise. For now, uncertainty will only delay such investments. Once things take on a more certain shape, the kind of relations the UK will retain with the EU will impact decisions on joint energy infrastructure with continental Europe.

Part, and an early sign, of the future pan-European electricity configurations is the **North Sea Offshore Grid Initiative**, a joint scheme between the UK, Germany, France, Denmark, Sweden, the Netherlands, Belgium, Ireland and Luxembourg to harness offshore wind energy and other renewable sources in the North Sea and channel clean energy across northern Europe. Whether the UK remains part of this project, which will be run in accordance with European rules and standards, remains open to question amidst the Brexit uncertainty. In case a hard approach is taken and the UK uses different rules and standards, it will be unable to reap the benefits of the inflows of thus generated clean energy (let alone at favourable prices). The consequences are not circumscribed to losses of clean energy; they are also very important in terms of flexibility afforded by the participation in supergrids, and hence in terms of energy security and resilience.

Similarly, the UK benefits exponentially from its place within gas networks (including interconnections with continental Europe) that provide the country with liquidity and hence low gas prices. **In case Brexit leads to trade barriers, the UK is set to suffer from increasing gas prices**. This might then lead to different outcomes: affordability losses, the spurring of clean energy investments, or, to the contrary, the encouragement of shale oil and gas exploration or even higher coal use.

The impact Brexit will come to bear on the labour market and the level of skills required for the energy transition remains a huge question mark, especially for the first post-Brexit years. In the case of a hard Brexit, the UK will have to source skills across the clean energy supply chain (research, installation, maintenance etc.) largely outside the EU, a daunting task in a short time-frame. Such a lack of skills may act as a further barrier to the fast-track roll-out and proliferation of renewable energy facilities.

12. Conclusions and recommendations

To sum up, climate policy should be commensurate with climate science diktats and climate change imperatives. This is cost-effective, in the sense that Welsh welfare hinges upon the indispensable maintenance of a healthy biophysical environment. It is also cost-efficient, as climate inaction comes with a hefty price tag, while climate action avoids severe climate damage and offers invaluable co-benefits in various other public policy sectors.

Contrary to other states lacking cornerstone legislation for future generations and cross-cutting policy mandates, the WFGA in an essential way streamlines Wales' future pathways. The equal weight of sustainability with other goals necessitates Wales to reflect upon its entrenched growth strategy, target sustainable welfare instead and move in the direction of a distinctive low-carbon polity.

The WFGA also mandates a bottom-up energy transition pathway that can have significant reverberations on the equality front. This can be joined up by large-scale renewables projects that can fuel industries and exports in a top-down way. An energy company for Wales can have a pivotal role in steering and fast-tracking the energy transition and become a hub for all energy stakeholders. The more the Brexit conundrum does not translate into hard and soft barriers with continental Europe, the more the energy transition will be facilitated.